



Metacognition and Suggestibility

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METACOGNITION AND SUGGESTIBILITY

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METACOGNITION AND SUGGESTIBILITY

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The underlying mechanisms of suggestibility consist both cognitive and social components. Generally speaking, age is associated with decreased suggestibility when the suggestibility is examined from the cognitive perspective. The dissertation examines how the acquisition of metacognitive ability (metamemory, narrative knowledge, source monitoring, and knowledge about knowledge) influences the extent of suggestibility from both cognitive and social perspectives. Preschool children's suggestibility was measured with Video Suggestibility Scale for Children (VSSC) (Scullin & Ceci, 2001), which consists of two subscales, Yield focusing more on the cognitive aspect of suggestibility and Shift focusing more on the social aspect. Older children recalled more information, yielded to fewer misleading questions and shifted more answers upon repeated interview following negative feedback. In Study 1, both aspects of metamemory (declarative and procedural) were involved. Children who could better monitor their memory performance in the procedural metamemory task were less likely to yield to misleading questioning. In contrast, children with better declarative metamemory changed their answers more. Study 2 investigated the relation between preschoolers' suggestibility and their knowledge about narrative context, which refers to children's ability to appreciate the accuracy demand of the narrative context and take audience's perspective into account. Children's knowledge about narrative context appeared to be an independent predictor of the tendency to shift their answers in repeated interviews following negative feedback. The purpose of Study 3

was to examine the relation between source monitoring and suggestibility. On one hand, children who could better monitor sources of information were less likely to yield to misleading questioning. On the other hand, children with better source monitoring ability changed their answers more. Study 4 examined the relation between children's knowledge about knowledge and suggestibility. An interview examining two types of knowledge about knowledge (temporary, situational judgement and trait, individual-dependent judgment) was specially designed for the study. There was no overall relation revealed but some individual items were associated with the extent of suggestibility. Taken together, the findings from the four experiments indicate the relation between metacognitive abilities and suggestibility in preschool children is complex. These studies extend our understanding of the individual factors associated with suggestibility, from both cognitive and social aspects.

BIOGRAPHICAL SKETCH

Shao, Yi was born on March 15, 1981 in Qingpu, a town in the suburb of Shanghai, China. She was the only child of her parents—her father, Shao, Xiaolong and her mother, Xu, Waneng. They received no formal education beyond primary school because of historical reason but placed a high value on education. They sent their only daughter off to Beijing, which is around 900 miles away, as a psychology major in Peking University in 1999. After half-a-year re-union while Yi worked as a primary school teacher, they sent her off again to explore further in psychology at Cornell University in 2004, on the other side of the world. Shao, Yi met Li, Yongchao in beautiful Ithaca, where they received marriage license in July 2007. Her daughter Winnie has witnessed the completion of the dissertation.

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CHAPTER 1

INTRODUCTION

Since 1980s, influenced by the trend of adopting the presumption that all witnesses are competent to provide testimony (Federal Rule of Evidence 601), children increasingly began to serve as key witnesses in court (Haugaard, Reppucci, Laird, & Nauful, 1991). Meanwhile, there is a growing concern about children's abilities to provide detailed and accurate reports of past events. It is well-established that younger children are more easily susceptible to false information provided by others than older children and adults (Bruck & Ceci, 1999; Ceci & Bruck, 1995). Recently, the focus of suggestibility study has moved beyond focusing on children of a certain age group to exploring the individual differences in suggestibility, which is of great legal implications. In the current studies, potential individual differences related to metacognition were examined.

The past three decades have witnessed a growing interest in suggestibility research, beginning in the 1970s (e.g., Loftus, 1975; McCloskey & Zaragoza, 1985; Zaragoza & Lane, 1994). Because of their legal implications, studies regarding the suggestibility of children have attracted a great deal of attention. In general, preschool-aged children are more susceptible to misleading post-event suggestions than older children and adults (Bruck & Ceci, 1999; Ceci & Bruck, 1993, 1995). However, within the same group, a great deal of variability in suggestibility is evident. Researchers have explored the individual characteristics that may account for variability within an age group. By far, the individual characteristics that have most often been identified are the cognitive factors of language ability and creativity, and the

social factors of self-concept, maternal attachment, and the parent-child relationship (Bruck & Melnyk, 2004).

In the current studies, I took a process prospective in examining suggestibility. In the process of incorporating information, individuals remember the specific event(event memory), know about their own memory (metamemory), know about other's knowledge status (knowledge about knowledge), monitor information from different sources (source monitoring), know how to respond appropriately in an interview (knowledge about narrative context), and report information on demand (language). Except event memory and language, as evidenced by previous studies (Bruck & Melnyk, 2004), all the mentioned processes are related to metacognition, the cognition about cognition.

Metacognitive skills are believed to play an important role in many types of cognitive activities, especially in the arena of learning. Despite of the considerable amount of research, relatively little is known about how the acquisitions translates into changes in children's everyday cognitive and social behaviors. Meanwhile, suggestibility could be redeemed as one type of learning information from the external sources. Although the result of misinformation effect is unwanted and negative, the process itself is adaptive. People are motivated to be accurate and be affiliated with other people (Cialdini & Goldstein, 2004). Therefore, integrating information from other resources is natural and inevitable. In the developmental trajectory, children do not learn to reduce the detrimental impact of misinformation effect. Instead, they learn how to manage the process as a consequence of their improving metacognitive capacity. Therefore, there is reason to believe that metacognitive skills play an important role in suggestibility. If proven, there is also reason to carry out interventions directly to children to reduce the negative impact of suggestibility.

Thus a model highlighting the metacognition capacity is the focus of the current studies. Specifically, different aspects of children's metacognitive capacity were examined as important individual difference factors related to suggestibility. It is expected that individual variation in these abilities, specifically metamemory (Chap 2), knowledge about narrative contexts (Chap 3), source monitoring (Chap 4) and knowledge about knowledge status (Chap 5) , can predict children's suggestibility independent of age.

REFERENCES

- Bruck, M. & Ceci, S. J. (1999). The suggestibility of children's memory. *American Review of Psychology, 50*, 419-439.
- Bruck, M., & Melnyk, L. (2004). Individual differences in children's suggestibility: A review and synthesis. *Applied Cognitive Psychology, 18*, 947-996.
- Ceci, S. J. & Bruck, M. (1993). The suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin, 113*, 403-439.
- Ceci, S. J. & Bruck, M. (1995). *Jeopardy in the Courtroom: A Scientific Analysis of Children's Testimony*, Washington, DC.
- Cialdini, R.B. & Goldstein, N.J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology, 55*, 591-621.
- Haugaard, J. J., Reppucci, N. D., Laird, J., & Nauful, T. (1993). Children's definitions of the truth and their competency as witnesses in legal proceedings. *Law and Human Behavior, 15*, 253-271.
- Loftus, E. F. (1975). Leading questions and the eyewitness report. *Cognitive Psychology, 7*, 560-572.
- McCloskey, M. & Zaragoza, M. (1985). Misleading postevent information and memory for events: Arguments and evidence against memory impairment hypotheses. *Journal of Experimental Psychology: General, 114*, 1-16.
- Zaragoza, M. S., & Lane, S. M. (1994). Source misattributions and the suggestibility of eyewitness memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 934-945.

CHAPTER 2

METAMEMORY AND SUGGESTIBILITY: FULL PICTURE MAY ONLY BE OBTAINED BY FULL EXAMINATION

Introduction

Metamemory, the knowledge about memory and one's own memory, is one important metacognitive process (Schneider, 1999). However, its role on suggestibility has received relatively little attention in the past research. In the current study, the relationship between metamemory and suggestibility was examined among preschool children, an age group easily susceptible to suggestibility.

There are two types of metamemory: declarative metamemory and procedural metamemory (Schneider, 1999; cf. Cavanaugh & Perlmutter, 1982). Declarative metamemory refers to the explicit and conscious knowledge about memory such as knowing the influential factors on memory performance, usually measured without concurrent memory activities. In contrast, procedural metamemory involves the implicit and unconscious knowledge about memory, specifically the monitoring and regulating the on-line memory activities.

The development of declarative metamemory extends throughout childhood but some metamemory is already available in preschool children. Preschool-aged children not only understand the memory related concepts (e.g., "forget") from a linguistic perspective (Macnamara, Baker, Olson, 1976), but also start to understand the mental processes associated with the concepts and related factors (e.g., amount of information to remember, Kreutzer, Leonard, Flavell, & Wagen, 1975; encoding time, Wellman, 1977; and time delay, Lyon & Flavell, 1993). For example, 5-year-olds rather than 3- and 4-year-olds understand that to remember/forget is associated with previously acquired knowledge (Wellman & Johnson, 1979). On the other hand, metamemory

development is more salient in school years. For example, children cannot master the knowledge such as related items, rather than unrelated items, would lead to false memories until the age of 6 (Jaswal & Dodson, 2009). Similarly, children younger than 9 failed to make memorability judgments on events (Ghetti & Alexander, 2004). In addition, preschoolers tend to believe that memory cannot be altered by misinformation or retroactive interference (O'Sullivan, Howe & Marche, 1996).

Different types of procedural metamemory occur at different stages of memory such as judgments of learning (JOL) occurring at the stage of learning (Koriat, 1997). Among them, confidence judgments operate during the retrieval stage (Nelson, 1996; Schneider, 1999), the stage related to suggestibility. In general, the relationship between confidence and accuracy can be indexed by discrimination (or resolution), over-underconfidence and calibration (Brewer & Wells, 2006). Discrimination refers to whether people report confidence at different levels between correct answers and incorrect answers. Adults show better discrimination than school-aged children (Roebbers, 2002), who demonstrate better discrimination than preschoolers (Roebbers, 2002; Roebbers & Howe, 2003). Good discrimination becomes salient during the late elementary school years (Pressley, Levin, Ghatala, & Ahmad, 1987). Over-/underconfidence is the tendency to over- or underestimate one's own performance. Generally speaking, individuals of all ages are overconfident about their memory performance and young children are no exception (Allwood, Granhag, & Jonsson, 2006; Lipko, Dunlosky, & Merriman, 2009). Last, calibration indicates how people match different levels of their subjective confidence ratings with their actual accuracy. Children's metacognitive monitoring judgments about their answers to unbiased questions can be appropriately calibrated (Howie & Roebbers, 2007).

Metamemory has been postulated to contribute to the memory performance. The memorial behaviors may be under the influence of metamemory and have an impact

on the memory outcome. For example, it has been suggested that the belief in prenatal memory might be associated with the behavior of seeking the recovery of prenatal memory through therapy (Garry, Loftus, & Brown, 1994). Previous studies have indicated a moderate relationship between metamemory and memory performance. For example, a meta-analysis revealed an overall correlation of .41 (Schneider & Pressley, 1997). In contrast, some researchers believe that we shall not assume the relationship between metamemory and memory performance because the impaired memory performance could be either due to knowledge deficiency or the utilization deficiency (Cavanaugh & Perlmutter, 1982). Under the circumstance that the demand of memory accuracy is low, people may not apply their declarative metamemory into utilization (utilization deficiency) despite of their occupancy of the corresponding declarative metamemory (knowledge deficiency).

However, the existent studies on the relationship between metamemory and memory performance have mainly focused on only one aspect of metamemory (declarative metamemory). It is unknown how the relationship is between memory and the two aspects of metamemory. The current study is aimed at filling this gap.

Furthermore, most previous studies on the metamemory-memory relationship have examined predominantly the remembering part of memory performance. Relatively few have explored when memory fails to function properly, for example, being distorted following postevent misleading information. Young children are generally highly susceptible to suggestibility (Bruck & Ceci, 1999; Ceci & Bruck, 1993). Therefore, it is unclear whether the association between metamemory and memory would be generalized to suggestibility. Few studies have examined this relationship. In a study, declarative metamemory was measured in an interview with preschool children and the scores of metamemory were compared with their performance in a suggestibility task (Geddie, Fradin, & Beer, 2000). However, five

out of the eight interview questions focused on short-term memory and memory strategies. Concerning the process of misinformation effect, this type of metamemory may play a rather small role. This is consistent with their finding that this type of metamemory is positively associated with total recall but not with responses to misleading questions. They found a trend between metamemory and suggestibility in correlation analysis but not in regressions. Declarative metamemory contributed to 6% of the variance in total recall but no significant contributions to resistance to misleading questions. Therefore, in the current study, children's declarative metamemory about general memory system and possible factors to contaminate memory were examined.

In the current study, both declarative and procedural metamemory were examined in terms of the relationship with suggestibility. An interview was developed following Wellman (1977) to explore declarative metamemory in preschoolers. Children were asked to make choices between pairs of dolls, portrayed in different memory-related situations. For procedural metamemory, children reported confidence judgments in a neutral memory interview. Child participants were asked unbiased, specific questions about a story they had previously heard and indicated how sure they were of the correctness of each answer. Last, suggestibility was examined with the Video Suggestibility Scale for Children (VSSC) (Scullin & Ceci, 2001). This is a measurement specifically designed for preschool children. Following its precedent Gudjonsson Suggestibility Scale (Gudjonsson, 1984), the advantage of the scale is that it allows measuring two types of suggestive questions (Yield and Shift). Usually, Yield is redeemed as the cognitive aspect of suggestibility whereas Shift indicates social aspect manipulated through negative feedback. The link between declarative metamemory and suggestibility would be explored considering the debates over the existence of the association. In addition, it was predicted that the worse the child can

monitor the memory performance, the more likely she or he is susceptible to others' misinformation.

Method

Participants

Fifty-six children (29 girls, 27 boys) recruited from four local day care centers and preschools participated. Their ages ranged from 37 months to 71 months ($M = 51.89$ months, $SD = 8.80$ months). The children were predominantly European Americans ($n = 48$), with a few children of Asian American ($n = 6$), African American ($n = 1$) and multiethnic ($n = 1$). An additional 2 children were dropped from the analyses due to out of the age range (85 month and 90 month) of the research interest. Written consent was obtained from each child's parent or legal guardian prior to the beginning of the study. Each child received a toy after the study.

Procedure

Trained research assistants interviewed the child in each school. The two tasks were carried out by different research assistants who had been trained specifically for that task. Prior to the research sessions, the interviewers visited the children's classrooms to acclimate with the children.

Suggestibility

Children first watched a 5-minute video "Billy's Birthday Party" in a quiet area in their school individually, occasionally in the group of two (Schullin & Ceci, 2001). The video included unexpected events such as fire alarm and some clumsy behaviors (falling down, broken toy and dropping a cake). The VSSC interview was administered at least one day after the video. The duration between the video and interview ranged from 1 to 21 days ($M = 4.20$, $Median = 3.00$, $SD = 3.78$). Two open-ended non-leading questions (e.g., "Who was at the party?") and two non-leading

probe questions (e.g. “What happened when the children opened the presents?”) were asked first as a memory recall test. Then children were asked 18 yes/no leading questions (e.g., “Did the two girls arrive at the party in a bright red car?”). After the first 9 questions, ambiguous negative feedback was given (“You have made a few mistakes. Let’s go over the questions again and see if you can do better.”) and the questions were repeated. The same procedure applied to the second 9 questions.

Children’s responses were audio taped and transcribed verbatim for scoring. The memory recall test was scored following the scoring schema of VSSC. In general, children received 1 point for mentioning one of the scoring unit listed in the scoring schema. The number of affirmation to the inaccurate leading questions were counted as Yield, and the number of changing answers between “yes” and “no” (including “I don’t know” and “no response”) was counted as Shift. The highest possible Yield score is 14 (because the correct answers for 4 of the 18 questions were “yes”), and the highest possible Shift score is 18.

Metamemory

Declarative Metamemory

The interview followed a similar procedure previously used in preschool children (Wellman, 1977). Child participants were first introduced two dolls in the same gender of child participants as brothers (or sisters) whose mother held a few memory contests between them. They were asked to judge the winner between the two who varied in factors related with memory. The two rememberers differed in one of the aspects as shown in Table 2.1. Each correct answer was scored 1. Their responses were scored 0 whenever they answered the questions incorrectly or indicated that the answer was based on guessing or preference to one of the two dolls.

Reliability analysis showed that all the items had strong positive correlations with the total scale (r 's = .43 to .64) and formed a reliability scale (Cronbach's $\alpha = .77$)

Procedural Metamemory

The interviewer read the child participants a story book "Bryan's Friday" prepared especially for the current study (for girls, "Emily's Friday"). After the story was over, child participants were briefly asked for opinions of the character in the story. Then children were informed that they would be asked questions about the story. They were trained to use the face scale to indicate their confidence. Following the result of a pilot study, a 3-point scale was used for children of this age. Children were instructed to point to the happy face when they were very sure, neutral face (referred as "blank/nothing face" in the study) when they were neither sure nor unsure, and sad face when they were not sure. A minimum of two practice questions ("What did you eat for breakfast?" "What did I eat for breakfast?") were asked for children to understand the correct way to rate their confidence with the face scale. The meaning for different faces was explained to children again if they failed to differentiate the two practice questions. Similar pair of practice questions were asked with more detailed instructions provided if the children failed to respond correctly.

Then children were asked 18 questions in an unbiased format on the critical activities in the order presented in the story. After giving their answers, children were asked to estimate their certainty of accuracy with the face scale. No confidence rating was required if the child answered "I don't know". We scored 0 for *sad face, not sure*, 1 for *neutral face, neither unsure nor sure*, and 2 for *happy face, sure*.

Calibration, over-/underconfidence and discrimination were calculated respectively following the formulas recommended by Brewer and Wells (2006).

When calculating calibration, confidence levels shall be within the range of 0 to 1. As a result, we first assigned 0, 0.5, and 1 to sad face, neutral face, and happy

Table 2.1

Declarative Metamemory Interview Questions

Items	Correct choice	Incorrect choice
1. Amount of information to learn	Small	Large
2. Encoding	Gist	Verbatim
3. Chunk	Yes	No
4. Encoding time	Short	Long
5. Allocation of study time based on the content of material	Yes	No
6. Interval after encoding	Short	Long
7. Rehearsal	Yes	No
8. Retrieval with a cue	Yes	No
9. Information characteristics	Central	Peripheral
10. Experience of retroactive interference	No	Yes
11. Experience of suggestibility	No	Yes

face responses, respectively. Then we used the formula as followed, where a_j denotes proportion of correct responses at confidence level j , c_j is the mean of the confidence ratings in confidence level j , n_j is the number of times the confidence level j was used, and n denotes the total number of questions:

$$\sum n_j (c_j - a_j)^2 / n.$$

The range of calibration is between 0 and 1, with a greater score indicating better calibration.

Over-/underconfidence was computed as the difference between mean confidence and overall proportion correct. It varies from -1 to 1, with negative values indicating underconfidence and positive values indicating overconfidence.

Discrimination was calculated with the following formula, where a denotes the average accuracy score:

$$\sum n_j (a_j - a)^2 / na(1-a).$$

Discrimination ranges between 0 and 1, with a greater value indicating a better resolution between correct and incorrect answers.

Results

Preliminary analysis found no effect of gender on accuracy of recall and two aspects of metamemory, thus was not considered further.

Descriptive Analyses

In the suggestibility task (VSSC), children correctly provided 1.50 items ($SD = 1.93$) in free recall test. They on average scored 8.02 ($SD = 3.96$) for Yield and 5.07 ($SD = 3.57$) for Shift. The delay between video watching and memory test was associated with Shift, $r(56) = .25$, $p = .06$, at a marginally significant level.

Due to the interviewer error or low interest of the child participant, a small amount ($n=18$) of the declarative metamemory questions were not asked. Therefore, a percentage score instead of the sum was calculated to indicate the overall performance.

The average score of the declarative metamemory was 0.48 ($SD = 0.27$, range = 0 – 0.90), not differently from chance level, $t(54) = 0.56$, $p = .58$.

In the recognition test related with confidence judgment, the average percentage of correct answers was 0.54 ($SD = 0.15$, range = 0.22-0.94). The average confidence rating was 1.56 ($SD = 0.41$) for all the answers, 1.72 ($SD = 0.39$) for correct answers and 1.38 ($SD = 0.50$) for incorrect answers. Child participants reported higher confidence for correct answers than for incorrect answers, $t(54) = 6.12$, $p < .001$, $d = .76$.

The average score of calibration was 0.15 ($SD = 0.10$, range = 0-0.44), with the conceptualized range between 0 (perfect calibration) and 1 (no calibration). The average score of over-/underconfidence was 0.24 ($SD = 0.20$, range = -0.17-0.67), with the conceptualized range between -1 (underconfidence) and 1 (overconfidence). The average score of discrimination was 0.20 ($SD = 0.24$, range = 0-1), with the conceptualized range between 0 (no discrimination) and 1 (perfect discrimination).

Metamemory and Suggestibility

The correlational analyses on declarative metamemory only revealed the association with Shift (Table 2.1). Children with better declarative metamemory tended to shift their answers following the negative feedback. Declarative metamemory appeared to be independent of age, memory, and Yield. The correlation analyses on procedural metamemory and suggestibility found association between Yield and two indices (over-/underconfidence and calibration) (Table 2.2). Those who could not calibrate their confidence ratings very well tended to yield to misleading questions. On the other hand, those who overestimated their performance were more likely to yield to misleading questions. The ability to report differentially between correct answers and incorrect answers was not associated with any variable of interest but the other two indices of procedural metamemory.

Table 2.2

Correlations between VSSC, Age, and Metamemory

Variables	1	2	3	4	5	6	7	8
1. Yield	-	-.21	-.39***	-.21	.13	-.19	.35**	.29*
2. Shift		-	.03	.24 [#]	.31*	-.16	-.06	-.13
3. Free recall			-	.29*	-.14	-.001	-.02	-.09
4. Age				-	-.07	-.09	-.19	-.13
5. Declarative Metamemory					-	.20	-.03	-.16
6. Discrimination						-	-.27*	-.35**
7. Over-/Underconfidence							-	.67***
8. Calibration								-

[#] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .005$.

Note. The possible range of calibration is between 0 (perfect calibration) and 1 (no calibration); the possible range of over-/underconfidence is between -1 (underconfidence) and 1(overconfidence). The possible range of discrimination is between 0 (no discrimination) and 1(perfect discrimination).

Multiple regression models were conducted to examine the role metamemory has played in suggestibility, compared with other individual factors. The results of these analyses are presented in Table 2.3. Procedural metamemory (over-/underconfidence and calibration, respectively) and the memory about the video independently contributed to the number of yields to misleading questions. In contrast, declarative metamemory, age and the interval of the video watching and memory test in VSSC test independently had an impact on the number of shifts.

Discussion

The current study was the first study to examine the two aspects of metamemory (declarative and procedural) and suggestibility. Within the range of preschool ages, younger children were less resistant to misleading questions but more resistant to negative feedback than older children. Higher procedural metamemory was associated with less yielding to misleading questioning whereas higher declarative metamemory seemed to be associated with more shifting answers upon negative feedback.

Consistent with the previous findings (Kreutzer, et al., 1975), preschool children only have limited and rudimentary declarative knowledge about memory. They answered fewer than half of the questions correctly, similar to guessing. Also consistent with some researchers' argument (Cavanaugh & Perlmutter, 1982), the association between declarative metamemory and memory is very weak. The utilization deficiency is evident among preschool children in that better knowledge about the factors related to memory did not lead to better memory. Instead, it has been suggested that the usage of declarative metamemory is related to various motivational and resource-allocation factors (Cavanaugh & Perlmutter, 1982). When situation is appropriate (e.g., memory goal is strongly desired), a high correlation might be

Table 2.3

Multiple Regression Analyses Predicting Suggestibility from Metamemory

Criterion	Predictors	β	t	R^2
Yield	Model 1:			.28****
	Free recall	-.39	-3.31***	
	Over-/Underconfidence	.35	2.93***	
Yield	Model 2:			.22***
	Free recall	-.37	-3.04***	
	Calibration	.26	2.11*	
Shift	Model 3:			.25***
	Age	.27	2.25*	
	Duration	.29	2.40*	
	Declarative Metamemory	.35	2.88**	

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$.

expected. In the current case, when children were given some negative feedback, children who had an advanced knowledge were more likely to shift their answers.

In terms of procedural metamemory, children in the age range studied showed some but not very satisfactory discrimination in their confidence ratings between correct and incorrect answers (Roebers, 2002; Roebers & Howe, 2003). They were also overestimating their memory performance (Allwood, et al., 2006; Lipko, et al., 2009). On the other hand, with the age-appropriate 3-point scale, they demonstrated pretty good calibration, matching their subjective confidence ratings with their actual performance. We failed to find the relationship between age and metamemory, either declarative or procedural, in the limited age range, which is consistent with previous studies showing more salient improvements during school years (Kreutzer, et al., 1975; Pressley, et al., 1987).

Consistent with previous studies (Roebers, 2002, study 1; Roebers & Howe, 2003), memory and the differentiation in procedural metamemory appear to be two independent processes when the interview was carried out in an unbiased way. Nevertheless, the procedural metamemory was associated with resistance to misleading questions. Those children who had worse ability to monitor their own performance, either by being too optimistic or failing to match their feelings with actual performance, were more easily susceptible to misleading questions.

The findings suggest that it is important to compare the two aspects to acquire a better knowledge about the relationship between metamemory and suggestibility. In addition, the measurement of suggestibility may also not be limited to yielding to misleading questions. As in the current study, if only the declarative metamemory and Yield was examined, we would replicate previous findings (Geddie, et al., 2000) that the relationship between metamemory and suggestibility is very weak. This, however, loses the whole image of the relationship as revealed in the current study that: a)

declarative memory plays an important and independent role when the memory goal is high by providing negative feedback; and b) the possibility of yielding to misleading questions is associated with the procedural metamemory that those who had better ability to monitor their own performance can better resist to suggestive interviews.

The current study has some limitations. First, the validity of the declarative metamemory interview specially designed for the current study, focusing mainly on the factors related to long-term memory, needs to be further examined. For example, it is difficult to guarantee that children were attending to the questions, which might be lengthy for their age. Future research can involve fact-checking questions or just repeating the descriptions . Retests might also be needed (Cavanaugh & Perlmutter, 1982).

The current study thus provides some evidence that there is some association between metamemory and suggestibility by examining both the declarative and procedural aspect of metamemory and not limiting the study of suggestibility as yielding to misleading questions. Specifically, the link between metamemory and suggestibility is moderate and independent of memory and age.

REFERENCES

- Allwood, C.M., Granhag, P.A., Jonsson, A. (2006). Child witnesses' metamemory realism. *Scandinavian Journal of Psychology*, 47, 461-470.
- Brewer, N. & Wells, G.L. (2006). The confidence-accuracy relationship in eyewitness identification: Effects of lineup instructions, foil similarity, and target-absent base rates. *Journal of Experimental Psychology: Applied*, 12, 11-30.
- Bruck, M. & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology*, 50, 419-439.
- Ceci, S.J., & Bruck, M. (1993). The suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, 113, 403-439.
- Cavanaugh, J.C. & Borkowski, J.G. (1980). Searching for metamemory-memory connections: A developmental study. *Developmental Psychology*, 16, 441-453.
- Cavanaugh, J.C. & Perlmutter, M. (1982). Metamemory: A critical examination. *Child Development*, 53, 11-28.
- Garry, M., Loftus, E.F., & Brown, S.W. (1994). Memory: A river runs through it. *Consciousness and Cognition*, 3, 438-451.
- Geddie, L., Fradin, S., & Beer, J. (2000). Child characteristics which impact accuracy of recall and suggestibility in preschoolers: Is age the best predictor? *Child Abuse and Neglect*, 24, 223-235.
- Ghetti, S. & Alexander, K.W. (2004). "If it happened, I would remember it": Strategic use of event memorability in the rejection of false autobiographical events. *Child Development*, 75, 542-561.
- Gudjonsson, G.H. (1984). A new scale of interrogative suggestibility. *Personality and Individual Difference*, 5, 303-314.

- Howie, P. & Roebbers, C.M. (2007). Developmental progression in the confidence-accuracy relationship in event recall: Insights provided by a calibration perspective. *Applied Cognitive Psychology, 21*, 871-893.
- Jaswal, V.K. & Dodson, C.S. (2009). Metamemory development: Understanding the role of similarity in false memories. *Child Development, 80*, 629-635.
- Koriat, A. (1997). Monitoring one's own knowledge during study: A cue-utilization approach to judgments of learning. *Journal of Experimental Psychology: General, 126*, 349-370.
- Kreutzer, M.A., Leonard, C., Flavell, J.H. & Hagen, J. W. (1975). An interview study of children's knowledge about memory. *Monographs of the Society for Research in Child Development, 40*, 1-60.
- Lipko, A.R., Dunlosky, J., & Merriman, W.E. (2009). Persistent overconfidence despite practice: The role of task experience in preschoolers' recall predictions. *Journal of Experimental Child Psychology, 103*, 152-166.
- Lyon, T.D. & Flavell, J. H. (1993). Young children's understanding of forgetting over time. *Child Development, 64*, 789-800.
- Macnamara, J., Baker, E., & Olson, C.L. (1976). Four-year-olds' understanding of "pretend", "forget", and "know": Evidence for propositional operations. *Child Development, 47*, 62-70.
- Nelson, T.O. (1996). Consciousness and metacognition. *American Psychologist, 51*, 102-116.
- O'Sullivan, J.T., Howe, M.L., & Marche, T.A. (1996). Children's beliefs about long-term retention. *Child Development, 67*, 2989-3009.
- Pressley, M., Levin, J.R., Ghatala, E.S., & Ahmad, M. (1987). Test monitoring in young grade school children. *Journal of Experimental Child Psychology, 43*, 96-111.

- Roebers, C.M. (2002). Confidence judgments in children's and adults' event recall and suggestibility. *Developmental Psychology*, 38, 1052-1067.
- Roebers, C.M. & Howie, P. (2003). Confidence judgments in event recall: Developmental progression in the impact of question format. *Journal of Experimental Child Psychology*, 85, 352-371.
- Salatas, H. & Flavell, J.H. (1976). Behavioral and metamnemonic indicators of strategic behaviors under "Remember" instructions in first grade. *Child Development*, 47, 81-89.
- Schneider, W. (1999). The development of metamemory in children. In D. Gopher, A. Koriath (Eds.), *Attention and Performance XVII*, pp. 487- 514. Boston, MA: MIT Press.
- Schneider, W. & Pressley, M. (1997). *Memory development between 2 and 20* (2nd ed.). Mahwah, NJ: Erlbaum.
- Scullin, M.H. & Ceci, S.J. (2001). A suggestibility scale for children. *Personality and Individual Differences*, 30, 843-856.
- Wellman, H.M. (1977). Preschoolers' understanding of memory-relevant variables. *Child Development*, 48, 1720-1723.
- Wellman, H.M. & Johnson, C.N. (1979). Understanding of mental processes: A developmental study of "remember" and "forget". *Child Development*, 50, 79-88.

CHAPTER 3

GROWING PAINS: BETTER KNOWLEDGE ABOUT NARRATIVE CONTEXT, HIGHER SUGGESTIBILITY

Introduction

In the past decades, age has been suggested to be the largest source of variance in suggestibility studies during childhood (Ceci & Bruck, 1993; Bruck & Ceci, 1999). Most of time, younger children, such as preschoolers, are more easily susceptible to misleading information than older children (for exceptions, see Brainerd, Reyna, & Ceci, 2008). Nevertheless, many improvements, both cognitive and social, have been made with age. On one hand, children become more competent in memory, thus less confused between the suggested information and the original event (Templeton & Wilcox, 2000). On the other hand, children become more competent in social interactions. They gain various social knowledge, such as the way to be a good narrator in different contexts. It is important to identify the specific developmental changes that are associated with suggestibility. The current study was to fulfill this goal by exploring the relationship between the increment with knowledge about narrative context and suggestibility.

Recollection is far more than a process of retrieval information from storage (Koriat & Goldsmith, 1996; Koriat, Goldsmith, & Pansky, 2000). The narrative context may also affect individuals' reports. People may be motivated to provide information as much as possible, or as accurate as possible, or just to meet the audience's expectation. Through the developmental path, individuals learn how to differentiate and respond correspondingly between various narrative contexts.

Young children fail to spontaneously discriminate between narrative contexts requiring quantity of information like free recall or quality of information like legal

related interview, which has been attributed as one explanation for their high susceptibility to misinformation. Most of time, children may feel pressured to provide maximum information instead of high quality of information. Young children tend to provide some answers even when the question itself is implausible to answer, especially when the question is in the closed format (Beuscher & Roebbers, 2005; Peterson, Dowden, & Tobin, 1999; Waterman, Blades, & Spencer, 2000). For example, when answering questions about a story, preschool children provided fewer correct answers to unanswerable wh- questions than school-aged children (Waterman, Blades, & Spencer, 2001).

Previous studies related with knowledge about narrative context and suggestibility were mainly intervention studies, where the focus on quality of the narrative context was highlighted by various means such as coaching to acknowledge “I don’t know”, rewarding accurate answers, and discussing the importance of being acquiescent when appropriate prior to memory interview (Mulder & Vrij, 1996; Roebbers, & Fernandez, 2002; Roebbers & Schneider, 2005; Saywitz & Moan-Hardie, 1994; Seidler & Howie, 1999). Following the manipulation, children increased responses with “I don’t know” and accuracy for the misleading questions was boosted. In conclusion, when the accuracy demand in narrative context is salient, children may resist misinformation. However, immediate feedback and reward with token, as the focus in the previous studies, do not naturally occur in the legal contexts. In addition, it is unclear about the role of knowledge on narrative context as an individual difference in suggestibility. The current study was expected to fill in the gap.

The research question is whether children with better knowledge of narrative context are less influenced by the misleading questions. In the current study, individual differences of interrogative suggestibility, the tendency to accept the misinformation during the interview, were examined with the Video Suggestibility

Scale for Children (VSSC) (Scullin & Ceci, 2001), a measurement specially designed for preschool children. Unlike previous intervention studies on narrative context, in VSSC, no ground rules were provided prior to the interview. That is, the demand on the quality was not highlighted in this specific narrative context. There are two subscales, Yield (assenting to misleading questions) and Shift (changing response upon negative ambiguous feedback). Yield and Shift reflect different mechanisms underlying suggestibility. The underlying mechanism involved in suggestibility might be both social and cognitive. On one hand, people may be subjected to misleading interviews due to their weak memory strength. On the other hand, people may just report what they assume an interviewer wishes them to report. In VSSC, Yield focuses more on the cognitive mechanisms (memory taint) whereas Shift reflects more on the social mechanism. Considering the knowledge about narrative context is more related with the social interactions, I expect it would have a greater influence on Shift than Yield. Shift was measured by repeated interview following mild negative feedback, which appeared to emphasize the “expectation” of the interviewer. Those who possess a better knowledge about the narrative context might capture the signal much more easily than those who are less competent in judging the appropriate responses in the narrative context. Therefore, I expect that the knowledge about narrative context, acquired with age, would be associated with high Shift.

Method

Participants

Fifty-four children (29 girls, 25 boys) recruited from four local day care centers and preschools participated. Their ages ranged from 37 months to 71 months ($M = 51.98$ months, $SD = 8.80$ months). The children were predominantly European Americans ($n = 46$), with a few of Asian American ($n = 6$), African American ($n = 1$) and multiethnic ($n = 1$). An additional 4 children were dropped from the analyses for

either failure to complete the interview protocol due to lack of interest ($n = 2$) or out of the age range (85 month and 90 month) of the research interest. Written consent was obtained from each child's parent or legal guardian prior to the beginning of the study. Each child received a toy after the study.

Procedure

Trained research assistants interviewed the child in each school. The two tasks were carried out by different research assistants who had been trained specifically for that task. Prior to the research sessions, the interviewers visited the children's classrooms to acclimate with the children. The order between the memory test and source-monitoring assessment varied among children.

Suggestibility

Children first watched a 5-minute video "Billy's Birthday Party" in a quiet area in their school individually, occasionally in the group of two (Schullin & Ceci, 2001). The video included unexpected events such as fire alarm and some clumsy behaviors (falling down, broken toy and dropping a cake). The VSSC interview was administered at least one day after the video. The duration between the video and interview ranged from 1 to 21 days ($M = 4.34$, $Median = 3.00$, $SD = 3.84$). Two open-ended non-leading questions (e.g., "Who was at the party?") and two non-leading probe questions (e.g., "What happened when the children opened the presents?") were asked first as a memory recall test. Then children were asked 18 yes/no leading questions (e.g., "Did the two girls arrive at the party in a bright red car?"). After the first 9 questions, ambiguous negative feedback was given ("You have made a few mistakes. Let's go over the questions again and see if you can do better.") and the questions were repeated. The same procedure applied to the second 9 questions.

Children's responses were audio taped and transcribed verbatim for scoring. The memory recall test was scored following the scoring schema of VSSC. In general, children received 1 point for mentioning one of the scoring unit listed in the scoring schema. The number of affirmation to the inaccurate leading questions were counted as Yield, and the number of changing answers between "yes" and "no" (including "I don't know" and "no response") was counted as Shift. The highest possible Yield score is 14 (because the correct answers for 4 of the 18 questions were "yes"), and the highest possible Shift score is 18.

Narrative Knowledge

Children heard brief scenarios between two characters (shown with two similar dolls in the gender of the child participant) answering questions and chose the one whose answer they liked. There were five pairs of comparison, with the correct answer counterbalanced between the two characters. The comparisons were: "I don't know" vs. guessing in forced choice; "I don't know" vs. acquiescence; no information vs. making up an answer; shifting originally correct answer vs. maintaining original answer; and taking the audience's perspective into account vs. not considering the audience's perspective (see Appendix for interview questions). Interviewers repeated the scenarios to make sure that children understand and remember the different answers.

Children's responses to the questions were scored 1 whenever they answered correctly. Their responses were scored 0 whenever they answered the questions incorrectly or indicated that the answer was based on guessing or preference to one of the two characters. Reliability analysis showed that the 5 items had strong positive correlations with the total scale ($r_s = .51$ to $.72$) and the internal consistency is

moderate (Cronbach's $\alpha = .55$). The scores were aggregated to index the children's knowledge about narrative context.

Results

Preliminary analysis found no effect of gender thus gender was not considered further.

Descriptive Analyses

Children correctly provided 1.56 items ($SD = 1.94$) in free recall test. They on average scored 7.93 ($SD = 3.95$) for Yield and 5.11 ($SD = 3.59$) for Shift. Children on average scored 2.67 ($SD = 1.48$) for narrative knowledge, not significantly better than chance level, $t(53) = 0.83$, $p = 0.41$. Table 3.1 displays the frequency of accuracy of each of the five questions measuring narrative knowledge.

Table 3.2 presents the correlations between memory (Yield, Shift, and free recall), narrative knowledge and age measured in months. Older children recalled more information and had better narrative knowledge than younger children. Children's Shift was significantly associated with narrative knowledge score, age and interval between video showing and misleading interview. Yield was significantly negatively associated with free recall and age. There were marginal significant negative associations between Yield and Shift, and between narrative knowledge and free recall.

Narrative Knowledge as an Independent Predictor

The main question here was whether the narrative knowledge predicted suggestibility. The results of the correlational analyses suggest that the narrative knowledge was associated with suggestibility by increasing the number of shifts in the interview. Interestingly, age plays a similar role in the number of shifts whereas

Table 3.1

Percentage of Accuracy for Components of Narrative Knowledge

Measure	Accuracy (%)
“I don’t know” vs. guessing	41
“I don’t know” vs. acquiescence	44
No answer vs. making-up	57
Maintaining original answer vs. yielding	57
Taking the audience’s perspective	67

Table 3.2

Correlations between Memory, Age, and Narrative Knowledge

Variables	1	2	3	4	5	6
1. Yield	-	-.18 [#]	-.38**	0	-.24*	.02
2. Shift		-	.02	.25*	.28*	.27*
3. Free recall			-	.08	.29*	-.22 [#]
4. Interval				-	-.05	-.14
5. Age					-	.24*
6. Narrative knowledge						-

[#] $p < .10$, * $p < .05$, ** $p < .01$.

narrative knowledge increases with age. A further question is to examine whether the influence of narrative knowledge onto shifts is just covaried with age.

A hierarchical linear regression was thus carried out. At Step 1, age, Yield, and interval between original event and memory test were entered as predictors of shifts. At Step 2, narrative knowledge was added to the model. The first model, excluding narrative knowledge, was significant, $F(3, 53) = 3.16, p = .03$ (see Table 3.3). Both age and interval were significantly independent predictors of Shift. When narrative knowledge was added to the model, the model became more significant, $F(4, 53) = 3.58, p = .01$. Narrative knowledge was a significant predictor of Shift. To note, the influence of age on Shift was reduced to a non-significant level. The change in R^2 was also significant, $F(1, 53) = 4.24, p = .04$.

Discussion

The present study examined how individual differences in the knowledge of narrative context would contribute to preschool children's suggestibility. Age and knowledge of narrative context were found to be associated with children's performance. On one hand, older children recalled more information and were less likely to yield to misleading questions. On the other hand, consistent with previous finding (Scullin & Ceci, 2001), older preschool children were more likely to change their answers in repeated questions following negative feedback. Further analyses indicated that the knowledge about narrative context, which increases with age, plays an independent role in increasing the tendency of changing answers. This is consistent with the results from the intervention studies that the influence of training to acknowledge "I don't know" in reducing suggestibility was independent of age (Mulder & Vrij, 1996).

Preschool children are still in the process of gaining narrative knowledge. They answered questions no better than chance level. From two questions in the interview,

Table 3.3

Hierarchical Linear Regression Predicting Shift from Interval, Age, Yield and Narrative Knowledge

Variables	β	t	R^2
Model 1:			.16*
Age	.26	2.00 [#]	
Interval	.26	2.02*	
Yield	-.12	-0.87	
Model 2:			.23*
Age	.20	1.46	
Interval	.30	2.33*	
Yield	-.14	-1.05	
Narrative knowledge	.27	2.06*	

[#] $p < .10$, * $p < .05$.

children demonstrated the tendency of providing some answers rather than acknowledging “I don’t know”. Notably, different from previous studies (Waterman, et al., 2000, 2001), children in the current study were not required to answer the question by themselves but rather to choose their preferred speaker. Therefore, children were expected to confront much less pressure as in answering questions in person in interviews. However, the tendency was still prevalent in preschool children. It is possible that the narrative contexts, such as mother-child conversations, that require quantity of information are the dominant type of narrative contexts among preschoolers. When the formal education starts, children will be introduced the test-type narrative context that highlights the demand on the accuracy of information.

Measured in the current interview, children who master the knowledge about narrative context are those who can tell the difference between the conditions expecting quantity and quality and the expectation of the audience. Equipped with this knowledge, they are more likely to be able to spontaneously adjust their narration to fit the demand of the context, based on their judgments (Roebers & Fernandez, 2002). In the present study, the interviewer watched the video together with children. In addition, no ground rule emphasizing accuracy was provided. Combined with repeated questioning and negative feedback, children who master the knowledge about narrative context may easily conclude that changing answers is the demand of the current interactions. In contrast, the knowledge about narrative context appeared to have no influence on the tendency to comply the answers, which is consistent with the fact that Yield is more associated with the original memory strength. This is consistent with previous findings that merely providing the opportunity to say “I don’t know” (vs. with reward) does not make significant impact in improving memory accuracy (Roebers, Moga, & Schneider, 2001).

Despite of the interesting finding revealed in the current study, it calls for more empirical evidence. First of all, the current study only focused on preschool children. Previous studies have found that preschool children change answers more often than school-aged children, especially to yes-no questions (Cassel, Robers, & Bjorklund, 1996; Poole & White, 1991). Thus it is important to expand the age range to school-aged children. A wide age range may provide a detailed and accurate picture of the relationship between age and suggestibility. How narrative knowledge plays a role in the relationship then becomes more intriguing. Second, the current study suggested that the difference of the performance across situations with different narrative demands (quality vs. quantity) might be more salient in children with a better narrative knowledge. Empirical studies varying the demands in the narrative context may help to examine the suggested relationship. Third, it is interesting to explore the process and influential factors for people to judge the demand of the narrative context. Last, the moderate reliability of the measurement on the narrative knowledge also needs to be further improved.

Although the misinformation effect leads to many unwanted problems in legal contexts and our daily life, it cannot be denied that misinformation effect is one of the natural processes of people's interaction in the social world. People shall tune their responses to meet the demand of the narrative context, being accurate, elaborative or meeting the expectation of the audience. Children learn to be a good narrator in the social context and have to experience the growing pains by changing their answers to please the interviewer.

APPENDIX

List of Narrative Knowledge Questions (for boys)

John and Billy are brothers. Who do you like?

Q1. “I don’t know” vs. guessing:

The teacher asked what an animal called a lemur looks like. She asked whether a lemur looks like a monkey or like a cat. Neither John nor Billy knew about it. John answered, “I don’t know”. Billy guessed an answer. Whose answer do you like?

Q2. “I don’t know” vs. acquiescence:

This time, the teacher asked what a plant called coleus looks like. She asked whether a coleus looks like pineapple. Neither John nor Billy knew about it. John said “yes”. Billy answered “I don’t know”. Whose answer do you like?

Q3. No information vs. making-up:

The teacher asked who broke the window. Neither John nor Billy knew about it. John didn’t answer the question. Billy made it up and said Laura broke it. Whose answer do you like?

Q4. Maintaining original answer vs. yielding:

One woman visited John and Billy’s house when their mother was out. When Mom came back, she asked whether the woman had a book in her hand. Both John and Billy said no at first. “Are you sure? Somebody with a book may visit us today.” Mother said. John said “yes, she had a book in her hand.” Billy said “no, she didn’t have a book in her hand.” Whose answer do you like?

Q5. Taking the audience's perspective:

Sandy was blindfolded. At this moment, a dog entered the room, made some noise and left. Sandy heard some noise and asked John and Billy, "What's wrong?". John said "it left". Billy said "the dog left". Whose answer do you like?

REFERENCES

- Beuscher, E. & Roebbers, C.M. (2005). Does a warning help children to more accurately remember an event, to resist misleading questions, and to identify unanswerable questions? *Experimental Psychology*, 52, 232-241.
- Brainerd, C.J., Reyna, V.F., & Ceci, S.J. (2008). Developmental reversals in false memory: A review of data and theory. *Psychological Bulletin*, 134, 343-382.
- Bruck, M. & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology*, 50, 419-439.
- Cassel, W.S., Roebbers, C.E.M., & Bjorklund, D.F. (1996). Developmental patterns of eyewitness responses to repeated and increasingly suggestive questions. *Journal of Experimental Child Psychology*, 61, 116-133.
- Ceci, S.J., & Bruck, M. (1993). The suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, 113, 403-439.
- Koriat, A., & Goldsmith, M. (1996). Monitoring and control processes in the strategic regulation of memory accuracy. *Psychological Review*, 103, 490-517.
- Koriat, A., Goldsmith, M., & Pansky, A. (2000). Toward a psychology of memory accuracy. *Annual Review of Psychology*, 51, 481-537.
- Mulder, M.R. & Vrij, A. (1996). Explaining conversation rules to children: An intervention study to facilitate children's accurate responses. *Child Abuse & Neglect*, 20, 623-631.
- Roebbers, C.M., & Fernandez, O. (2002). The effects of accuracy motivation on children's and adults' event recall, suggestibility, and their answers to unanswerable questions. *Journal of Cognition and Development*, 3, 415-443.
- Roebbers, C.M., Moga, N., & Schneider, W. (2001). The role of accuracy motivation on children's and adults' event recall. *Journal of Experimental Child Psychology*, 78, 313-329.

- Roebers, C.M., & Schneider, W. (2005). The strategic regulation of children's memory performance and suggestibility. *Journal of Experimental Child Psychology, 91*, 24-44.
- Saywitz, K.J. & Moan-Hardie, S. (1994). Reducing the potential for distortion of childhood memories. *Consciousness and Cognition, 3*, 408-425.
- Seidler, K.M., & Howie, P.M. (1999). Motivational factors in children's reporting of events: The influence of age and expected reinforcement contingency. *Journal of Applied Developmental Psychology, 20*, 101-118.
- Scullin, M.H. & Ceci, S.J. (2001). A suggestibility scale for children. *Personality and Individual Differences, 30*, 843-856.
- Templeton, L.M. & Wilcox, S.A. (2000). A tale of two representations: The misinformation effect and children's developing theory of mind. *Child Development, 71*, 402-416.
- Waterman, A.H., Blades, M., & Spencer, C. (2000). Do children try to answer nonsensical questions? *British Journal of Developmental Psychology, 18*, 211-225.
- Waterman, A.H., Blades, M., & Spencer, C. (2001). Interviewing children and adults: The effect of question format on the tendency to speculate. *Applied Cognitive Psychology, 15*, 521-531.

CHAPTER 4

THE FLIP SIDE: SOURCE MONITORING MAY INCREASE SUGGESTIBILITY

Introduction

The studies on children's suggestibility are important to the applied issues in legal contexts as well as the theoretical issues in children's cognitive and social development. Young children, especially preschoolers, are more easily susceptible to misleading information than older children and adults (Ceci & Bruck, 1993; Bruck & Ceci, 1999; Goodman, 2006; for exceptions, see Brainerd, Reyna, & Ceci, 2008). Suggestibility, although represented as a negative aspect of memory, is indeed a natural process in the social context (Foley, Passalacqua, & Ratner, 1993). Everyday, people incorporate information from different sources into their own memory, motivated to be not only accurate but also cooperative with co-narrators. At the same time that children develop their ability to be accurate, they also grow to be more cooperative. Therefore, factors may influence both the cognitive and social aspect of suggestibility. Source monitoring ability could be such a case, which was examined in the current study.

Source monitoring refers to the attribution the sources of their own representations (Johnson, Hashtroudi, & Lindsay, 1993). Young children have great difficulty with different types of source monitoring (Roberts, 2002). For example, children have worse reality monitoring than adults. That is, they misattribute more easily an actual perceptual experience with internally generated representations, such as imagined experience and belief (Foley & Johnson, 1985; Foley, Johnson, & Raye, 1983; Lindsay, Johnson, & Kwon, 1991). Preschool children also performed poorer in reality monitoring than school-aged children (Sluzenski, Newcombe, & Ottinger, 2004). Another type of confusion emerges when differentiating two similar external

sources. Preschoolers had more difficulty than school-aged children and adults distinguishing information from similar sources, such as words spoken by two speakers (Drummey & Newcombe, 2002; Lindsay, et al., 1991; Poole & Lindsay, 2001). The type of source monitoring specifically related with the process of suggestibility is the differentiation between their direct experience and another external source. Children gain their ability to identify the source of their knowledge during preschool years (O'Neill & Gopnik, 1991; Wimmer, Hogrefe, & Perner, 1988). Young school-aged (6-year-old) children discriminate memories of what they have said from memories of what they have heard as well as older children (9-year-old) and adolescents (17-year-old) (Foley, Johnson, & Raye, 1983).

Compared with older children and adults, younger children have greater difficulty in differentiating their own life experience from suggested information from others (Ackil & Zaragoza, 1995). They are more likely to claim actual seeing information that was only suggested to them. A link between suggestibility and source misattributions has been indicated. First of all, when preschool children have a better source memory about an event, they are more likely to resist to suggestion in the form of leading questions (Giles, Gopnik, & Heyman, 2002). Although suggestibility decreases and source monitoring accuracy increases with age, the relationship seems to be invariant with age. Along the same line, following training to think of the two external sources about the target event, preschool children are less suggestible to misleading interviews (Nesbitt & Markham, 1999; Thierry, Spence, & Memon, 2001; Thierry & Spence, 2002), mainly by reducing the false alarm rates. Furthermore, this kind of source monitoring intervention is more powerful than the detail-orientated memory training (Nesbitt & Markham, 1999; Giles, et al., 2002). Second, when source monitoring is measured with a task independent of the target event, the individual difference of source monitoring of preschool children contributes to the variation in

children's suggestibility (Leichtman, Morse, Dixon, & Spiegel, 2000). Third, children benefit from the change of the question type into source-directed questions in the memory interview. For example, when source information is presented simultaneously in source-directed questions, even 3-year-olds are less likely to yield to misleading narratives than responding to classic recognition questions, as well as 6-year-olds (Bright-Paul, Jarrold, & Wright, 2005).

The studies reviewed support the contention that source monitoring ability serves as a resistant factor to suggestibility. However, those aforementioned studies have all focused exclusively on the suggestibility measured as yielding to misleading questions, which is worrisome. The other aspect of misleading interview such as inappropriate feedback and social pressure through repetitive questioning has been indicated to have a strong or even greater impact than simply suggestive questioning (Garven, Wood, Malpass, & Shaw, 1998). Based on the previous findings, the recommendation of adopting source monitoring intervention can be easily made to legal practitioners. However, it is hazardous under the condition that the relationship between source monitoring and suggestibility mainly due to social reasons remains unknown. The current study was dedicated to explore this issue.

The research question is whether children with better source monitoring ability are less suggestible in different measures varying in the focus on cognitive aspect vs. social aspect. In the current study, individual differences of interrogations suggestibility, the tendency to accept the misinformation during the interview, were examined with the Video Suggestibility Scale for Children (VSSC) (Scullin & Ceci, 2001), a measurement specifically designed for preschool children. Following its precedent Gudjonsson Suggestibility Scale (Gudjonsson, 1984), the advantage of the scale is that it allows measuring the impact of both cognitive and social aspect of suggestibility through two types of suggestive questions (Yield and Shift). Concerning

the subscale of Yield, the current study was expected to replicate the findings from previous studies that source monitoring plays a protective role in suggestibility. In terms of Shift, however, when the social demand is high, I predict those who can determine whether the source of information is the witness' own event memory or the interviewer's suggestive remarks are able to "correctly" answer their answer as "expected" from the interviewer. That is, they would shift answers more than those with worse source monitoring abilities.

Method

Participants

Fifty-four children (29 girls, 25 boys) recruited from four local day care centers and preschools participated. Their ages ranged from 37 months to 71 months ($M = 51.98$ months, $SD = 8.80$ months). The children were predominantly European Americans ($n = 46$), with a few children of Asian American ($n = 6$), African American ($n = 1$) and multiethnic ($n = 1$). An additional 4 children were dropped from the analyses for either failure to complete the interview protocol due to lack of interest ($n = 2$) or out of the age range (85 month and 90 month) of the research interest. Written consent was obtained from each child's parent or legal guardian prior to the beginning of the study. Each child received a toy after the study.

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Suggestibility

Children first watched a 5-minute video “Billy’s Birthday Party” in a quiet area in their school individually, occasionally in the group of two (Schullin & Ceci, 2001). The video included unexpected events such as fire alarm and some clumsy behaviors (falling down, broken toy and dropping a cake). The VSSC interview was administered at least one day after the video. The duration between the video and interview ranged from 1 to 21 days ($M = 4.34$, $Median = 3.00$, $SD = 3.84$). Two open-ended non-leading questions (e.g., “Who was at the party?”) and two non-leading probe questions (e.g., “What happened when the children opened the presents?”) were asked first as a memory recall test. Then children were asked 18 yes/no leading questions (e.g., “Did the two girls arrive at the party in a bright red car?”). After the first 9 questions, ambiguous negative feedback was given (“You have made a few mistakes. Let’s go over the questions again and see if you can do better.”) and the questions were repeated. The same procedure applied to the second 9 questions.

Children’s responses were audio taped and transcribed verbatim for scoring. The memory recall test was scored following the scoring schema of VSSC. In general, children received 1 point for mentioning one of the scoring unit listed in the scoring schema. The number of affirmation to the inaccurate leading questions were counted as Yield, and the number of changing answers between “yes” and “no” (including “I don’t know” and “no response”) was counted as Shift. The highest possible Yield score is 14 (because the correct answers for 4 of the 18 questions were “yes”), and the highest possible Shift score is 18.

Source Monitoring

The task followed a version of Gopnik and Graf’s (1988) task, designed for preschool children. Children either saw or were told about the content (picture card) in

6 different drawers. Each time, they were interviewed about the content (e.g., “What’s in the green drawer?”) and source (e.g., “How do you know what is in the green drawer? Did you see it or did I tell you about it?”). These two questions served as the immediate test for content and source, respectively. Regardless of the accuracy of their answer, the interviewer confirmed with the correct descriptions before moving on to the next item (e.g., “OK, You saw a cow in the green drawer.”) After this repeated for 6 times, they were asked to put the picture cards back into their original drawers. After they put each picture card, they were asked about the same question about the source of the information (e.g., “How do you know this is in the green drawer? Did you see it or did I tell you about it?”). This served as the delayed test for content and source. Children received a score of 0-6 for each of the four source monitoring tasks.

Results

Preliminary analysis found no effect of gender and was not considered further.

Descriptive Analyses

In the suggestibility task (VSSC), children correctly provided 1.56 items ($SD = 1.94$) in free recall test. They on average scored 7.93 ($SD = 3.95$) for Yield and 5.11 ($SD = 3.59$) for Shift.

In the source monitoring task, children correctly recalled the content of the drawer ($M = 5.42$, $SD = 1.38$) and source of the information ($M = 5.45$, $SD = 1.03$) in immediate task. In contrast, children could only recall part of the content of the drawer ($M = 2.41$, $SD = 1.74$) and source of the information ($M = 3.30$, $SD = 2.04$) in the delayed task, which was not significantly different from chance level, $t(53) = 1.07$, $p = 0.29$. Table 4.1 presents the correlations between memory (Yield, Shift, and free recall), age in months, and source monitoring performance in four tasks (immediate content, immediate source, delayed content, and delayed source). In VSSC, older

Table 4.1

Correlations between Memory, Age, and Source Monitoring

Variables	1	2	3	4	5	6	7	8	9
1. Yield	-	-.18 [#]	-.38**	0	-.24*	.01	-.06	-.19 [#]	-.30*
2. Shift		-	.02	.25*	.28*	-.06	-.03	.10	.41***
3. Free recall			-	.08	.29*	.03	-.05	.24*	.20 [#]
4. Interval				-	-.05	-.15	-.35**	.12	.21 [#]
5. Age					-	.05	.22 [#]	.31*	.18 [#]
6. Immediate content						-	.33**	.02	-.10
7. Immediate source							-	-.12	-.09
8. Delayed content								-	.11
9. Delayed source									-

[#] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .005$.

both immediate and delayed tasks. Immediate content and source performance was also related.

Between source monitoring and suggestibility, recall performance in VSSC was correlated with delayed content memory and delayed source recall performance in source monitoring task, with the latter at a marginal level. Delayed source recall was negatively correlated with assents to misleading questions. There was a trend that delayed content memory was associated with greater resistance to yielding to suggestions. In the contrast, delayed source recall was positively correlated with shifting the answers.

Surprisingly, the interval between video showing and memory questioning in VSSC was negatively associated with immediate source recall performance and marginally related with delayed source recall performance.

Source Monitoring as an Independent Predictor

The next question was whether the source monitoring predicted suggestibility. The results of the correlational analyses suggest that the performance in delayed source monitoring task was associated with suggestibility by decreasing the number of yields and increasing the number of shifts in the interview. Interestingly, age plays a similar role in Yield and Shift whereas source monitoring appears to be increasing with age. A further question is to examine whether the influence of source monitoring onto suggestibility is just covaried with age.

A hierarchical linear regression thus was carried out for yields and shifts, respectively. At Step 1 of the model for Yield, age and recall scores in VSSC were entered as predictors. At Step 2, source monitoring with the scores from the delayed task was added to the model. The first model, excluding source monitoring, was significant, $F(2, 53) = 5.08, p = .01$ (see Table 4.2). Memory about the video rather than age was significantly associated with fewer yields. In the second model, delayed

Table 4.2

Hierarchical Linear Regression Predicting Yield from Age, Free Recall and Source Monitoring

Variables	β	t	R^2
Model 1:			.17*
Age	-.14	-1.07	
Free recall	-.34	-2.57*	
Model 2:			.21**
Age	-.11	-.85	
Free recall	-.31	-2.33*	
Delayed source monitoring	-.22	-1.69 [#]	

[#] $p < .10$, * $p < .05$, ** $p < .01$.

source monitoring performance was a marginal predictor of Yield and the model became more significant, $F(3, 53) = 4.45, p = .008$. To note, the influence of memory on Yield was reduced. There was a trend that the change in R^2 was significant, $F(1, 53) = 2.84, p = .10$.

A similar procedure was applied to Shift. At Step 1, age and interval between video and memory test were treated as predictors. At Step 2, delayed source score was added to the model. The first model without source monitoring was significant, $F(2, 53) = 4.38, p = .02$ (see Table 4.3). Both age and interval were significantly independent predictors of Shift. When source monitoring was added to the model, the model became more significant, $F(3, 53) = 5.34, p = .003$. Remarkably, source monitoring became the only significant predictor of Shift. The change of R^2 was also significant, $F(1, 53) = 6.33, p = .02$.

Discussion

The current study was the first to examine the relationship between source monitoring and suggestibility upon social pressure as well as the traditional cognitive aspect of suggestibility of assenting to misinformation. Age and source monitoring were found to be associated with children's performance in two types of suggestibility.

In terms of yielding to misinformation, we replicated previous findings that older children were less suggestible (Scullin & Ceci, 2001) and had better source monitoring ability (O'Neill & Gopnik, 1991; Wimmer, et al., 1988). Also, consistent with previous findings, better source monitoring appeared to be associated with greater resistance to yielding to suggested misinformation, independent of age (Leichtman, et al., 2000).

In addition to mnemonic factors, the subscale of Shift in the current study reflected the suggestibility packaged with different social factors such as authority (the interviewer watched the video together with children), repeated questioning and

Table 4.3

Hierarchical Linear Regression Predicting Shift from Age, Interval, Yield and Source Monitoring

Variables	β	t	R^2
Model 1:			.15*
Age	.26	2.25*	
Interval	.26	2.02*	
Model 2:			.24***
Age	.23	1.82 [#]	
Interval	.19	1.53	
Delayed source monitoring	.32	2.52*	

[#] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .005$.

negative feedback. Concerning changing answers, consistent with previous finding (Scullin & Ceci, 2001), older preschool children shifted their answers more often upon repeated questions following negative feedback. Further analyses indicated that the source monitoring, which increases with age, plays an independent role in increasing the tendency of changing answers. That is, children, who can monitor the sources of contradictory information between their own original memory and the interviewer's suggestion, easily shift their answers to meet the demand of the interviewer.

The findings are important both to the legal contexts and theoretical issues in developmental psychology. A general assumption made in the published work has been that the ability of monitoring sources of one's knowledge can help one resist false suggestions. However, for practitioners, the previous message of improving source monitoring to resist suggestibility is inadequate. Suggestibility encompasses both cognitive and social factors. The responsibility for reducing children's suggestibility and increasing the accuracy of reports lies in the system rather than exclusively in children's abilities. In addition to adopting procedures such as source monitoring sources, efforts should be made to reduce the interviewer bias to the minimum extent. The intervening in source monitoring only makes sense when children are interviewed in a non-misleading environment. Otherwise, the situation will turn out to be much worse, even than the condition without intervention.

For researchers, the findings also indicate that changes other than source monitoring between preschool age and school-age might be associated with the reduced suggestibility in the age range. In the current study focused on the preschool age range, older children were more likely to change their answers. However, beyond preschool age, younger children (6-year-olds) changed their answers upon repeated questioning more than older children (8-year-olds) and adults (Cassel & Bjorklund,

1995). More work is needed to discover the underlying mechanism for this reversed-U shaped development.

The current study also calls for more exploration on this topic. First, changing answers in repeated questions could be just the effect of social compliance rather than changing the mental representations (Bjorklund, Bjorklund, Brown, & Cassel, 1998). In the present study, we only focused on interrogative suggestibility, that is, the tendency to accept (mis)information during questioning. The result of the interrogative suggestibility remained unknown. It is very likely that those children with a better source monitoring ability, although changed their answers more frequently, later would still maintain a better memory toward the original event. Further studies may help to answer the question. Second, the age range may be expanded beyond preschool to involve school-aged children. Considering the tendency of shifting answers upon repeated questioning decreases from preschool children to school-aged children (Cassel, Robers, & Bjorklund, 1996; Poole & White, 1991), a better knowledge about the relationship between source monitoring and suggestibility may be obtained. Third, the results would be more compelling if a less biased interview had been included as a comparison. Fourth, in future studies, a source-monitoring test on memory for what was actually seen in the video could have been included.

A previous assumption about the relationship between source monitoring and suggestibility only focuses on the cognitive aspect of suggestibility that source monitoring serves as a resistant to suggestibility. The present study indicates that the relationship might depends on the social demand of the misleading interview. When the interview is highly biased, better source monitoring is associated with higher suggestibility.

REFERENCES

- Ackil, J.K. & Zaragoza, M.S. (1995). Developmental differences in eyewitness suggestibility and memory for source. *Journal of Experimental Child Psychology, 60*, 57-65.
- Bjorklund, D.F., Bjorklund, B.R., Brown, R.D., & Cassel, W.S. (1998). Children's susceptibility to repeated questions: How misinformation change children's answers and their minds. *Applied Developmental Science, 2*, 99-111.
- Brainerd, C.J., Reyna, V.F., & Ceci, S.J. (2008). Developmental reversals in false memory: A review of data and theory. *Psychological Bulletin, 134*, 343-382.
- Bright-Paul, A., Jarrold, C., & Wright, D.B. (2005). Age-appropriate cues facilitate source-monitoring and reduce suggestibility in 3- to 7-year olds. *Cognitive Development, 20*, 1-18.
- Bruck, M. & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology, 50*, 419-439.
- Cassel, W.S., & Bjorklund, D.F. (1995). Developmental patterns of eyewitness memory and suggestibility: An ecologically based short-term longitudinal study. *Law and Human Behavior, 19*, 507-532.
- Cassel, W.S., Roebbers, C.E.M., & Bjorklund, D.F. (1996). Developmental patterns of eyewitness responses to repeated and increasingly suggestive questions. *Journal of Experimental Child Psychology, 61*, 116-133.
- Ceci, S.J., & Bruck, M. (1993). The suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin, 113*, 403-439.
- Drummey, A.B. & Newcombe, N.S. (2002). Developmental changes in source memory. *Developmental Science, 5*, 502-513.

- Foley, M.A., Johnson, M.K., & Raye, C.L. (1983). Age-related changes in confusion between memories for thoughts and memories for speech. *Child Development, 54*, 51-60.
- Foley, M.A., & Johnson, M.K. (1985). Confusions between memories for performed and imagined actions: A developmental comparison. *Child Development, 56*, 1145-1155.
- Foley, M.A., Passalacqua, C., & Ratner, H.H. (1993). Appropriating the actions of another: Implications for children's memory and learning. *Cognitive Development, 8*, 373-401.
- Garven, S., Wood, J.M., Malpass, R.S., & Shaw, J.S. (1998). More than suggestion: The effect of interviewing techniques from the McMartin preschool case. *Journal of Applied Psychology, 83*, 347-339.
- Giles, J.W., Gopnik, A., & Heyman, G.D. (2002). Source monitoring reduces the suggestibility to preschool children. *Psychological Science, 13*, 288-291.
- Goodman, G.S. (2006). Children's eyewitness memory: A modern history and contemporary commentary. *Journal of Social Issues, 62*, 811-832.
- Gopnik, A. & Graf, P. (1988). Knowing how you know: Young children's ability to identify and remember the sources of their beliefs. *Child Development, 5*, 1366-1371.
- Gudjonsson, G.H. (1984). A new scale of interrogative suggestibility. *Personality and Individual Difference, 5*, 303-314.
- Johnson, M.K., Hashtroudi, S., & Lindsay, D.S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28.
- Leichtman, M.A., Morse, M.B., Dixon, A., & Spiegel, R. (2000). Source monitoring and suggestibility: An individual differences approach. In Roberts, K.P. &

- Blades, M. (Ed.). *Children's source monitoring*. (pp. 257-287). Mahwah, NJ: Erlbaum.
- Lindsay, D.P., Johnson, M.K., & Kwon, P. (1991). Developmental changes in memory source monitoring. *Journal of Experimental Child Psychology*, 52, 297-318.
- Nesbitt, M. & Markham, R. (1999). Improving young children's accuracy of recall for an eyewitness event. *Journal of Applied Developmental Psychology*, 20, 449-459.
- Newcombe, P.A., & Siegal, M. (1996). Where to look first for suggestibility in young children. *Cognition*, 59, 337-356.
- O'Neill, D.K., & Gopnik, A. (1991). Young children's ability to identify the sources of their beliefs. *Developmental Psychology*, 27, 390-397.
- Poole, D.A., & Lindsay, D.S. (2001). Children's eyewitness reports after exposure to misinformation from parents. *Journal of Experimental Psychology: Applied*, 7, 27-50.
- Poole, D.A. & White, L.T. (1991). Effects of question repetition on the eyewitness testimony of children and adults. *Developmental Psychology*, 27, 975-986.
- Roberts, K.P. (2002). Children's ability to distinguish between memories from multiple sources: Implications for the quality and accuracy of eyewitness statements. *Developmental Review*, 22, 403-435.
- Scullin, M.H. & Ceci, S.J. (2001). A suggestibility scale for children. *Personality and Individual Differences*, 30, 843-856.
- Sluzenski, J., Newcombe, N., & Ottinger, W. (2004). Changes in reality monitoring and episodic memory in early childhood. *Developmental Science*, 7, 225-245.
- Thierry, K.L., Spence, M.J., & Memon, A. (2001). Before misinformation is encountered: Source monitoring decreases child witness suggestibility. *Journal of Cognition and Development*, 2, 1-26.

- Thierry, K.L. & Spence, M.J. (2002). Source-monitoring training facilitates preschoolers' eyewitness memory performance. *Developmental Psychology*, 38, 428-437.
- Wimmer, H., Hogrefe, G., & Perner, J. (1988). Children's understanding of informational access as source of knowledge. *Child Development*, 59, 386-396.

CHAPTER 5

KNOWLEDGE ABOUT KNOWLEDGE AND SUGGESTIBILITY

Introduction

Much of our knowledge is gained from other informants. People accept information with evaluating its validity rather than unquestioningly. Researchers have recently started to examine how children evaluate the credibility of the informant (Miller, 2000). The relationship between preschool children's knowledge about knowledge and their suggestibility in a memory task is the focus of the present study.

There are two types of evaluations on other people's knowledge status (Miller, 2000). The first is a temporary, situational judgment, such as the immediate relationship between perceptual experience and knowledge status and the confidence shown by the informant. Eighteen-month infants already demonstrate an implicit understanding of the relationship between visual perception and knowledge status (Poulin-Dubois, Sodian, Metz, Tiden, & Schoeppner, 2007). By the age of 3 or 4 years, children appear to have a sophisticated understanding of the link between perception and knowledge (Pillow, 1989; Pratt & Bryant, 1990; Robinson & Whitcombe, 2003; Wimmer, Hogrefe, & Perner, 1988). For example, 4-year-olds understand that someone who has not heard the video will be ignorant about the specific information only mentioned in the video (Mossler, Marvin, & Greenberg, 1976). To learn the name of a novel object, preschool children trust people who has made it more than people who has not (Sabbagh & Baldwin, 2001). In addition, three-year-olds already know whether to pick up the information based on the certainty expressed by the informant (Jaswal & Malone, 2007; Sabbagh & Baldwin, 2001).

The second is a trait, individual-dependent judgment. The judgment may be based on the informants' characteristics, such as age, interest involved in the event, and their

history. Young children hold the belief that adults know more than young children (Taylor, Cartwright, & Bowden, 1991). Children younger than second grade fail to discount the claims that are consistent with the informant's interest (Mills & Keil, 2005). Four-year-old children already demonstrate preference the informant with a past of accuracy over the inaccurate and ignorant informants (Clement, Koenig, & Harris, 2004; Koenig, Clement, & Harris, 2004; Koenig & Harris, 2005). The preference may extend beyond the domain in which the two informants have previously demonstrated the difference in reliability (Rakoczy, Warneken, & Tomasello, 2009). Most of these studies were carried out in the context of word learning. On three trials, one informant labeled a familiar object correctly whereas the other did not. On the subsequent test trial, whether children would prefer to ask or endorse the label provided by the reliable informant over the unreliable one was examined. It has been suggested that children's efficiency of evaluating the reliability of the informants varies with the domain of the information. Children may have a better accuracy in the tasks related with semantic knowledge (e.g., word learning) than epistemic knowledge (e.g., identity of the object) (Nurmsoo & Robinson, 2008). From paradigms like these, it has been found that children as young as three years old may also draw inference based on the information provided by the informant with a good track record (Birch, Vauthier, & Bloom, 2008).

Children's ability to correctly accept or reject information provided by an informant is very important in children's eyewitness testimony. In the legal context, each interviewer for child witnesses may introduce them new and possibly incorrect information which has potentially biasing effects on children's subsequent reports. Preschool children were easily susceptible to misleading information (Bruck & Ceci, 1999; Ceci & Bruck, 1993). Nevertheless, during the process of answering questions, children may compare their own knowledge status to the interviewer's knowledge

status of the same event and decide whether to update their own memory with the information provided by the interviewer. For example, preschool children know whether to believe the utterance based on whether the speaker has the direct access to the information (Robinson, Champion, & Mitchell, 1999). And school-aged children are more likely to say “I don’t know” to unanswerable questions to an interviewer who is ignorant about the original event than a knowledgeable interviewer (Waterman, Blades, & Spencer, 2004).

In addition, the handful of research on the effect of warning in suggestibility is also illustrative to the relationship between knowledge about knowledge and suggestibility. In these studies, participants were warned about the misleading questions by acknowledging either the ignorance of the interviewer or the questions being tricky. That is, the informant’s credibility was invalidated explicitly to participants. However, it is inconclusive whether warning can reduce suggestibility in preschool children (Beuscher & Roebbers, 2005). The research evidence indicates that children's increased ability to evaluate the informant's knowledge status may be associated with less suggestibility.

By far, only a few studies have directly examined the relationship between children’s knowledge about knowledge and suggestibility, mostly examining only from one of the two aspects of the evaluations. In the studies focusing on the situational judgments (Welch-Ross, 1999a, 1999b), preschool children were interviewed about a story they but not the interviewer had previously heard. Some of the questions consisted of misleading information. Children’s understanding of seeing leads to knowing was also examined. The findings were mixing. In one study, knowledge about knowledge had no impact on either the initial yielding to misleading interview or the subsequent memory (Welch-Ross, 1999b). In contrast, in the other study(Welch-Ross, 1999a) and a study integrating the task into other theory-of-mind

tasks (Bright-Paul, Jarrold, & Wright, 2008), better source knowledge played a role, independent of age, in resisting misleading questioning, especially among children who had poor memory about the original event. In another group of studies, the evaluation of credibility focusing on trait judgments was examined. Misinformation effect was decreased or even diminished when the misinformation was delivered by a child (Ceci, Ross, & Toglia, 1987) or a silly adult (Lampinen & Smith, 1995) than a credible adult.

In the real-life situations, comparing the knowledge status may involve both aspects. In addition, the conditions might be much more complex beyond the mere two aspects, such as combination across the two. The informant may demonstrate high individual-based credibility but low on the situation-based credibility, for example, a policeman who has not experienced the original event. This has been little examined. The only exception is a study weighing two different factors both belong to trait judgments. Between the two kinds of factors indexing reliability, preschool children can weigh history of reliability over age (Jaswal & Neely, 2006). Therefore, in the current study, a series of questions would be used to examine both the context-dependent and individual-dependent aspects of knowledge about knowledge.

The present research investigated knowledge about knowledge as a promising influential factor of children's suggestibility in a misleading interview. Epistemic information rather than semantic information was relevant to the context of eyewitness testimony. Therefore, two informants (dolls) providing conflicting epistemic information such as the identity of familiar objects were compared in the current study. Different from some previous studies on knowledge about knowledge, judgment between the two informants instead of the identity of the object were asked for the following two reasons: to exclude the potential influence of memory about the identity of the object and to make the task brief and more age appropriate. Each child picked

one of the two dolls as the one they would seek information. Children's suggestibility was examined with the Video Suggestibility Scale for Children (VSSC) (Scullin & Ceci, 2001), a measurement specifically designed for preschool children.

Method

Participants

Fifty-three children (28 girls, 25 boys) recruited from four local day care centers and preschools participated. Their ages ranged from 37 months to 71 months ($M = 52.26$ months, $SD = 8.63$ months). The children were predominantly European Americans ($n = 45$), with a few of Asian American ($n = 6$), African American ($n = 1$) and multiethnic ($n = 1$). An additional 5 children were dropped from the analyses for either failure to complete the interview protocol due to lack of interest ($n = 3$) or out of the age range (85 month and 90 month) of the research interest. Written consent was obtained from each child's parent or legal guardian prior to the beginning of the study. Each child received a toy after the study.

Procedure

Trained research assistants interviewed the child in each school. The two tasks were carried out by different research assistants who had been trained specifically for that task. Prior to the research sessions, the interviewers visited the children's classrooms to acclimate with the children. The order between the memory test and source-monitoring assessment varied among children.

Suggestibility

Children first watched a 5-minute video "Billy's Birthday Party" in a quiet area in their school individually, occasionally in the group of two (Scullin & Ceci, 2001). The video included unexpected events such as fire alarm and some clumsy behaviors (falling down, broken toy and dropping a cake). The VSSC interview was

administered at least one day after the video. The duration between the video and interview ranged from 1 to 21 days ($M = 4.11$, $Median = 3.00$, $SD = 3.67$). Two open-ended non-leading questions (e.g., “Who was at the party?”) and two non-leading probe questions (e.g., “What happened when the children opened the presents?”) were asked first as a memory recall test. Then children were asked 18 yes/no leading questions (e.g., “Did the two girls arrive at the party in a bright red car?”). After the first 9 questions, ambiguous negative feedback was given (“You have made a few mistakes. Let’s go over the questions again and see if you can do better.”) and the questions were repeated. The same procedure applied to the second 9 questions.

Children’s responses were audio taped and transcribed verbatim for scoring. The memory recall test was scored following the scoring schema of VSSC. In general, children received 1 point for mentioning one of the scoring unit listed in the scoring schema. The number of affirmation to the inaccurate leading questions were counted as Yield, and the number of changing answers between “yes” and “no” (including “I don’t know” and “no response”) was counted as Shift. The highest possible Yield score is 14 (because the correct answers for 4 of the 18 questions were “yes”), and the highest possible Shift score is 18.

Knowledge about Knowledge

The materials include four dolls (three adult dolls and one child doll) , picture cards depicting single familiar item, drawers and one box with a big window and a small window.

The dolls were introduced to the child participants during the test. Children participated in a game with 16 forced-choice questions between two informants. For each question, child participant first heard the descriptions about the two informants (if applicable), watched the two informants gain some perceptual experience, heard the

information he or she would seek, then chose between one of the two informants. The 16 questions were listed in Table 5.1. We scored 1 for each correct answer unless the child participant indicated that the judgment was based on guessing. Reliability analysis showed the internal consistency is moderate (Cronbach's $\alpha = .53$).

Results

Preliminary analysis found no effect of gender on accuracy of recall and knowledge about knowledge, thus gender was not further considered.

In the suggestibility task (VSSC), children correctly provided 1.55 items ($SD = 1.96$) in free recall test. They on average scored 7.96 ($SD = 3.98$) for Yield and 5.06 ($SD = 3.60$) for Shift. Better memory about the video in the free recall task was associated with less yields to the misleading interview, $r(53) = -.38, p = .005$.

The percentage of accuracy of each interview question was listed in Table 5.1. Except two questions (adult informant vs. child informant; adult with poor past of reliability and perceptual experience vs. adult with good past of reliability but no perceptual experience), children preferred one of the informant significantly than chance level. Due to the interviewer error or low interest of the child participant, a small amount ($n=2$) of the knowledge about knowledge interview questions were not asked. Therefore, a percentage score instead of the sum was calculated to indicate the total performance. The average score of the knowledge about knowledge was 0.68 ($SD = 0.15$, range = 0.31 – 1.00).

The correlational analyses only revealed that age was correlated with knowledge about knowledge, $r(53) = .35, p = .01$. No relationship between knowledge about knowledge and either indice of suggestibility (Yield and Shift) was found. Age was associated with both Yield and Shift. Older children were less likely to yield to misleading questions, $r(53) = -.27, p = .06$, but were more likely to shift their answers upon negative feedback, $r(53) = .32, p = .02$.

Table 5.1

Knowledge about Knowledge Interview Questions and Percentage of Accuracy

Item	Credible Informant	Informant	Accuracy (%)
1	Adult looks into the drawer	Adult does nothing	.89
2	Adult looks into the drawer	Adult thinks very hard	.89
3	Adult looks into the drawer	Adult closes his eyes and makes a picture in his head that he can see the inside of the drawer	.85
4	Adult looks into the drawer	Adult looks at the outside of the drawer	.77
5	Adult looks into the drawer	Adult lifts the drawer up	.74
6	Adult looks into the box through the big window	Adult looks into the box through the small window	.64
7	Adult looks into the box, says, "I know this quite clearly."	Adult looks into the box, says, "I'm not at all sure about this."	.75
8	A sea shell collection competition was just over in the town. Everyone in the town knows who the winner is. An adult who was not involved in the competition.	An adult who took participation in the competition and really wanted everyone else thought he had the most sea shells.	.15
9	An adult who is nice looks into the drawer	An adult who is naughty and always ticks other people looks into the drawer	.77
10	A smart adult looks into the drawer	A silly adult looks into the drawer	.66
11	An adult looks into the drawer	A child looks into the drawer	.60

Table 5.1(Continued)

12	A child who makes the picture	An adult who does not make the picture	.66
13	An adult who has answered questions correctly for three times answers a question similar with previous questions	An adult who has made mistakes three times answers a question similar with previous questions	.79
14	A child who has answered questions correctly for three times answers a question similar with previous questions	An adult who has made mistakes three times answers a question similar with previous questions	.32
15	An adult who has made mistakes three times looks into the drawer	An adult who has answered correctly three times feels the outside of the drawer without looking into the drawer	.58
16	An adult who has made one mistake out of five questions answers a question similar with previous questions	An adult who has made three mistakes out of five answers a question similar with previous questions	.77

For Yield, series of analyses were carried out with the correctness of each interview question as fixed factor, controlling for age and memory about the video. For Shift, similar analyses were carried out with the correctness of each interview question as fixed factor, controlling for age. The number of yields and shifts only vary on a few of the items (Table 5.2). Two items indicating children's understanding that perceptual experience leads to knowledge were found to be associated with suggestibility, yields and shifts, respectively. The differentiation between the outcome of looking and thinking in the knowledge status was associated with fewer shifts whereas the discrimination between looking and imaging in mind was associated with fewer yields. On the other hand, interestingly, when children understand that the interest involved in an event may bias the credibility of the information, they were more likely to shift upon negative feedback.

Discussion

The current study examined the relationship between knowledge about knowledge and suggestibility. Importantly, both the situational and individual-based evaluations were included when examining knowledge about knowledge (Miller, 2000). Preschool children already hold some sophisticated knowledge about knowledge that their overall performance is pretty satisfactory. Although the overall performance of knowledge about knowledge was not found to be associated with either of the two indices of suggestibility, analyses based on individual items found some association. Consistent with the previous findings (Bright-Paul, et al., 2008; Welch-Ross, 1999a), knowledge about knowledge serves as a protecting factor against susceptibility to misleading questions in some situations. However, in a task which is beyond the preschool children's understanding (Mills & Keil, 2005), those who correctly discounted the information from the informant who had interests involved in the event were more likely to shift their answers following negative feedback.

Table 5.2

Knowledge about Knowledge and Suggestibility

Item	Knowledge about knowledge	Suggestibility	Correct	Incorrect	<i>F</i>
2	Perceptual experience leads to knowledge	Shift	4.74 (3.60)	7.50 (2.74)	2.97 [#]
3	Perceptual experience leads to knowledge	Yield	7.57 (3.99)	10.88 (2.03)	4.35*
8	Interest involved may bias the information provided	Shift	7.38 (4.98)	4.64 (3.19)	3.03 [#]

[#] $p < .10$, * $p < .05$.

The limited evidence in the current study indicates that the situational rather than individual-based evaluations may play a more important role in suggestibility. This is consistent with the previous finding that in the domain of epistemic knowledge, children are less likely to focus on past reliability to evaluate the informants (Nurmsoo & Robinson, 2008).

The missing link between the overall knowledge about knowledge and suggestibility is very intriguing. It is possible that knowledge about knowledge plays a trivial role in suggestibility, as previously found (Welch-Ross, 1999b) and has been suggested in warning studies (Beuscher & Roebbers, 2005). It is also possible that the tests in the current study were not sensitive enough to capture the underlying difference. On one hand, the validity of the knowledge about knowledge interview needs to be further examined. On the other hand, in the current suggestibility task, the knowledge status was not different between the interviewer and the child except the age. Different from previous studies (e.g., Welch-Ross, 1999b), the child and the interviewer in the current study watched the video together. There was little need for children to apply their knowledge about knowledge to resist the misinformation from the interviewer. To better explore the relationship between knowledge about knowledge, an interviewer who is known to child participants with a poorer knowledge status than themselves might be more appropriate.

In early childhood, it is important for children to be gullible so that they could quickly learn information from the environment. However, with their ages, they start to evaluate information critically. The relationship between knowledge about knowledge and suggestibility to misleading information in a memory task is still controversial. The current study provides some preliminary evidence that the understanding of the relationship between perceptual experience and knowledge status may play a role of reducing suggestibility, independent of the age and memory effect.

REFERENCES

- Beuscher, E. & Roebbers, C.M. (2005). Does a warning help children to more accurately remember an event, to resist misleading questions, and to identify unanswerable questions? *Experimental Psychology*, 52, 232-241.
- Birch, S.A.J., Vauthier, S.A., Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, 107, 1018-1034.
- Bright-Paul, A., Jarrold, C., & Wright, D.B. (2008). Theory-of-mind development influences suggestibility and source monitoring. *Developmental Psychology*, 44, 1055-1068.
- Bruck, M. & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology*, 50, 419-439.
- Ceci, S.J., & Bruck, M. (1993). The suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, 113, 403-439.
- Ceci, S.J., Ross, D.F., & Toglia, M.P. (1987). Suggestibility of children's memory: Psycholegal implications. *Journal of Experimental Psychology: General*, 116, 38-49.
- Clement, F., Koenig, M., & Harris, P. (2004). The ontogenesis of trust. *Mind and Language*, 19, 360-379.
- Jaswal, V.K. & Malone, L.S. (2007). Turning believers into skeptics: 3-year-olds' sensitivity to cues to speaker credibility. *Journal of Cognition and Development*, 8, 263-283.
- Jaswal, V.K. & Neely, L.A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, 17, 757-758.

- Koenig, M.A., Clement, F., & Harris, P.L. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science, 15*, 694-698.
- Koenig, M.A. & Harris, P.L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development, 76*, 1261-1277.
- Lampinen, J.M. & Smith, V.L. (1995). The incredible (and sometimes incredulous) child witness: Child eyewitnesses' sensitivity to source credibility cues. *Journal of Applied Psychology, 80*, 621-627.
- Mills, C.M. & Keil, F. C. (2005). The development of cynicism. *Psychological Science, 16*, 385-390.
- Miller, S. A. (2000). Children's understanding of preexisting differences in knowledge and belief. *Developmental Review, 20*, 227-282.
- Mossler, D.G., Marvin, R.S., & Greenberg, M.T. (1976). Conceptual perspective taking in 2- to 6-year-old children. *Developmental Psychology, 12*, 85-86.
- Nurmsoo, E. & Robinson, E.J. (2008). Identifying unreliable informants: Do children excuse past inaccuracy?. *Developmental Science, 11*, 905-911.
- Pillow, B.H. (1989). Early understanding of perception as a source of knowledge. *Journal of Experimental Child Psychology, 47*, 116-129.
- Poulin-Dubois, D., Sodian, B., Metz, U., Tiden, J., & Schoeppner, B. (2007). Out of sight is not out of mind: Developmental changes in infants' understanding of visual perception during the second year. *Journal of Cognition and Development, 8*, 401-425.
- Pratt, C. & Bryant, P. (1990). Young children understand that looking leads to knowing (so long as they are looking into a single barrel). *Child Development, 1990*, 973-982.

- Rakoczy, H., Warneken, F., & Tomasello, M. (2009). Young children's selective learning of rule games from reliable and unreliable models. *Cognitive Development, 24*, 61-69.
- Robinson, E.J., Champion, H., & Mitchell, P. (1999). Children's ability to infer utterance veracity from speaker informedness. *Developmental Psychology, 35*, 535-546.
- Robinson, E.J. & Whitcombe, E.L. (2003). Children's suggestibility in relation to their understanding about sources of knowledge. *Child Development, 74*, 48-62.
- Sabbagh, M.A. & Baldwin, D.A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development, 72*, 1054-1070.
- Scullin, M.H. & Ceci, S.J. (2001). A suggestibility scale for children. *Personality and Individual Differences, 30*, 843-856.
- Taylor, M., Cartwright, B.S., & Bowden, T. (1991). Perspective taking and theory of mind: Do children predict interpretive diversity as a function of differences in observers' knowledge? *Child Development, 62*, 1334-1351.
- Waterman, A.H., Blades, M., & Spencer, C. (2004). Indicating when you do not know the answer: The effect of question format and interviewer knowledge on children's "don't know" responses. *British Journal of Developmental Psychology, 22*, 335-348.
- Welch-Ross, M.K. (1999a). Preschoolers' understanding of mind: Implications for suggestibility. *Cognitive Development, 14*, 101-131.
- Welch-Ross, M.K. (1999b). Interviewer knowledge and preschoolers' reasoning about knowledge states moderate suggestibility. *Cognitive Development, 14*, 423-442.

Wimmer, H., Hogrefe, G., & Perner, J. (1988). Children's understanding of informational access as source of knowledge. *Child Development*, 59, 386-396.

CHAPTER 6

GENERAL DISCUSSION

The current studies examined four aspects of metacognition and suggestibility and revealed some interesting findings. Metamemory, knowledge about narrative context and source monitoring abilities were associated with preschool children's suggestibility. Furthermore, these revealed influences were independent of the age effect. Interestingly, in the current age group, better metacognition does not guarantee less suggestibility but rather depending on how we define and measure suggestibility. As one process of incorrectly accepting misinformation from external sources, suggestibility may be presented in different ways. In the current studies, assenting to misleading questions and changing previous answers in repeated questioning upon negative feedback were explored, with the former referred as Yield and the latter referred as Shift. The findings indicated that better procedural metamemory and source monitoring was associated with fewer Yields. In contrast, declarative metamemory, knowledge about narrative contexts and source monitoring abilities increased the number of Shifts.

Research focusing on individual differences is helpful to uncover the mechanism of children's suggestibility (Bruck & Melnyk, 2004). The current studies indicate both cognitive and social factors are related to suggestibility. On one hand, better memory is associated with more resistance to misleading information (Pezdek & Roe, 1995) across all the studies. On the other hand, social factors also play an important role. For example, when there is individual difference in social related knowledge (e.g., knowledge about narrative context), there is difference in suggestibility. Considering the fact that initial false assents have been indicated to

reflect the cognitive aspect of suggestibility and shifting to reflect social oriented mechanism, the present studies suggest that metacognition may play different roles in suggestibility depending on the different mechanisms (Kulkofsky & Klemfuss, 2008; Schullin & Ceci, 2001). Other work, like training studies, however, needs to be carried out to address the causal relationship between metacognition and suggestibility.

The current study has some limitations. For example, the validity of several metacognition measurements (metamemory, knowledge about narrative context, and knowledge about knowledge status) were designed and used for the first time in the current study. Most of them only have moderate reliability, which needs to be improved in future studies.

In addition, in the present studies, only interrogative suggestibility (assents and shifts to misleading questions) was examined. As previously stated, even within interrogative suggestibility, great variation has been revealed in terms of suggestibility and metacognition. However, interrogative suggestibility is just one way of suggestibility. How the metacognition has played a role in children's incorporating false information into their later reports has remained unanswered. Future research is needed to provide more information about the relationship between metacognition and suggestibility.

Some of the interesting findings also call for further studies. For example, in the current studies, a small age range (3 to 5) was the focus in which we found that changing answers upon negative feedback increased with age. Although the finding was consistent with previous studies (Schullin & Ceci, 2001), more studies in the area of suggestibility have suggested that preschoolers are more likely to change their answers than school-aged children (Cassel, Robers, & Bjorklund, 1996; Poole & White, 1991). More studies with a wider age range are helpful to resolve the discrepancy.

In conclusion, the current studies suggest that metacognition plays an important role in preschool children's suggestibility. It may both increase and decrease the extent of suggestibility, depending on the measurement of suggestibility. The results highlight that cognitive and social mechanisms underlie suggestibility.

REFERENCES

- Bruck, M. & Melnyk, L. (2004). Individual differences in children's suggestibility: A review and synthesis. *Applied Cognitive Psychology, 18*, 947-996.
- Cassel, W.S., & Bjorklund, D.F. (1995). Developmental patterns of eyewitness memory and suggestibility: An ecologically based short-term longitudinal study. *Law and Human Behavior, 19*, 507-532.
- Kulkofsky, S. & Klemfuss, J. Z. (2008). What the stories children tell can tell about their memory: Narrative skill and young children's suggestibility. *Developmental Psychology, 44*, 1442-1456.
- Pezdek, K. & Roe, C. (1995). The effect of memory trace strength on suggestibility. *Journal of Experimental Child Psychology, 60*, 116-128.
- Poole, D.A. & White, L.T. (1991). Effects of question repetition on the eyewitness testimony of children and adults. *Developmental Psychology, 27*, 975-986.
- Scullin, M.H. & Ceci, S.J. (2001). A suggestibility scale for children. *Personality and Individual Differences, 30*, 843-856.